520 Rec'd PCT/PTO 25 OCT 1999

FORM-PTO-1390 (Rev. 10-96) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 025265-155
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) 09/403608
INTERNATIONAL APPLICATION NO. PCT/AU98/00868	INTERNATIONAL FILING DATE 18 October 1998	PRIORITY DATE CLAIMED 21 October 1997
TITLE OF INVENTION COATED SUNGLASS LENS		
APPLICANT(S) FOR DO/EO/US Sola International Holdings Ltd		

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and the PCT Articles 22 and 39(1).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US)
6. [ ] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [ ] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [X] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
    [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information: WIPO Publication No. WO99/21048 with International Search Report

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U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.50) 09/403608	INTERNATIONAL APPLICATION NO. PCT/AU98/00868	ATTORNEY'S DOCKET NUMBER 025265-155

17. [X] The following fees are submitted:				CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO .... $840.00 (970) International preliminary examination fee paid to USPTO (37 CFR 1.482) .... $670.00 (956) No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) .... $760.00 (958) Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO .... $970.00 (960) International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) $96.00 (962)					
ENTER APPROPRIATE BASIC FEE AMOUNT =				$970.00	
Surcharge of **$130.00 (154)** for furnishing the oath or declaration later than 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				$	
Claims	Number Filed	Number Extra	Rate		
Total Claims	44 -20 =	24	X$18.00 (966)	$432.00	
Independent Claims	6 -3 =	3	X$78.00 (964)	$234.00	
Multiple dependent claim(s) (if applicable)			+ $260.00 (968)	$	
TOTAL OF ABOVE CALCULATIONS =				$1,636.00	
Reduction for 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				$	
SUBTOTAL =				$1,636.00	
Processing fee of **$130.00 (156)** for furnishing the English translation later than 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). per property +				$	
TOTAL FEES ENCLOSED =				$1,636.00	
				Amount to be: refunded	$
				charged	$

a. [X] A check in the amount of $ 1,636.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. 02-4800 in the amount of $______ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-4800. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:
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NAME

39,300
REGISTRATION NUMBER

(09/99)

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Patent
Attorney's Docket No. 025265-155

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of Brandon YIP et al. Application No.: TBA (National Stage Filing of PCT/AU98/00868) Filed: October 25, 1999 For: COATED SUNGLASS LENS	Group Art Unit: Unassigned Examiner: Unassigned

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-cited Application on the merits, please amend the application as follows:

IN THE CLAIMS:

Please delete claims 1-44 without prejudice or disclaimer.

Please add the following new claims:

--45. An optical lens including

a lens element; and

an asymmetric reflectance, light absorbing coating including at least four overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on

the eye side of the optical lens and a desired colour on the other side of the optical lens; and

wherein the asymmetric reflectance, light absorbing coating includes alternative layers of a dielectric material and a metallic material which is a metal or metal nitride.

46. An optical lens according Claim 45, wherein

the dielectric material is selected from one or more of Al_2O_3, $BaTiO_3$, Bi2O3, B_2O_3, CeO_2, Cr_2O_3, Ga_2O_3, GeO_2, Fe_2O_3, HfO_2, In_2O_3, Indium-tin oxide, La_2O_3, MgO, Nd_2O_3, Nb_2O_5, Pr_2O_3, Sb_2O_3, Sc_2O_3, SiO, SiO_2, SnO_2, Ta_2O_5, TiO, TiO_2, Ti_2O_3, Ti_3O_5, WO_3, Y_2O_3, Yb_2O_3, ZnO, ZrO_2; AlF_3, BaF_2, CaF_2, CdF_2, CeF_3, HfF4, LaF_3, LiF, MgF_2, NaF, Na_3AlF_6, $Na_5Al_3Fl_{14}$, NdF_3, PbF_2, PrF_3, SrF_2, ThF_4, ZrF_4; Si_3N_4, AlN, or diamond-like carbon, and

the metallic material is selected from the metals, or metal nitrides of one or more of Silver (Ag), Aluminium (Al), Gold (Au), Barium (Ba), Boron (B), Cadmium (Cd), Cerium (Ce), Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe), Germanium (Ge), Hafnium (Hf), Indium (In), Iridium (Ir), Potassium (K), Lanthanum (La), Magnesium (Mg), Manganese (Mn), Molybdenum (Mo), Nickel (Ni), Neodymium (Nd), Niobium (Nb), Lead (Pb), Palladium (Pd), Platinum (Pt), Rhenium (Re), Antimony (Sb), Selenium (Se), Silicon (Si), Tin (Sn), Strontium (Sr), Tantalum (Ta), Titanium (Ti), Tellurium (Te), Thallium (Tl), Vanadium (V), Tungsten (W), Zinc (Zn) or Zirconium (Zr).

47. An optical lens according to Claim 45, wherein the asymmetric reflectance, light absorbing coating further includes a compatible dielectric top layer or layers.

48. An optical lens according to Claim 47, wherein the compatible dielectric layer or layers are of suitable material and thickness to provide a desired colour to the optical lens.

49. An optical lens including

a lens element; and

an asymmetric reflectance, light absorbing coating including at least four alternating layers of Silica (SiO_2) and Chromium (Cr), Niobium (Nb) or Zirconium (Zr) metal; and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens.

50. An optical lens according to Claim 49, wherein the asymmetric reflectance, light absorbing coating includes an additional dielectric layer or layers other than silica of such a thickness to provide a desired colour to the optical lens.

51. An optical lens according to Claim 49, wherein the asymmetric reflectance, light absorbing coating includes alternating layers of silica and niobium metal and an

additional niobium oxide (Nb_2O_5) and/or silica (SiO_2) layer of such thicknesses to provide a desired colour to the optical lens.

52. An optical lens according to Claim 45, wherein a surface of the lens is subjected to a surface treatment.

53. An optical lens according to Claim 52, wherein the surface treatment improves adhesion thereto.

54. An optical lens according to Claim 53, wherein a surface is subjected to a plasma treatment.

55. An optical lens according to Claim 53, wherein an adhesion promoting coating is applied to a surface.

56. An optical lens according to Claim 45, wherein a surface of the lens element bears a mark thereon, the mark being visible from the front surface of the optical lens, but not being visible from the eyeside thereof.

57. An optical lens according to Claim 56, wherein the asymmetric reflectance, light absorbing coating is deposited on the surface bearing the mark, to render the mark substantially invisible from the eyeside of the lens.

58. An optical lens according to Claim 45, wherein the lens element is a laminate optical lens.

59. A multi-coated optical lens including

a lens element;

an asymmetric reflectance, light absorbing coating including a plurality of overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the lens;

wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride;

a secondary coating which provides a desirable optical and/or mechanical property to the optical lens.

60. A multi-coated optical lens according to Claim 59, wherein the dielectric material is selected from one or more of Al_2O_3, $BaTiO_3$, Bi_2O3, B_2O_3, CeO_2, Cr_2O_3, Ga_2O_3, GeO_2, Fe_2O_3, HfO_2, In_2O_3, Indium-tin oxide, La_2O_3, MgO, Nd_2O_3, Nb_2O_5, Pr_2O_3, Sb_2O_3,

Sc_2O_3, SiO, SiO_2, SnO_2, Ta_2O_5, TiO, TiO_2, Ti_2O_3, Ti_3O_5, WO_3, Y_2O_3, Yb_2O_3, ZnO, ZrO_2; AlF_3, BaF_2, CaF_2, CdF_2, CeF_3, HfF4, LaF_3, LiF, MgF_2, NaF, Na_3AlF_6, $Na_5Al_3Fl_{14}$, NdF_3, PbF_2, PrF_3, SrF_2, ThF_4, ZrF_4; Si_3N_4, AlN, or diamond-like carbon; and

the metallic material is selected from the metals, or metal nitrides of one or more of Silver (Ag), Aluminium (Al), Gold (Au), Barium (Ba), Boron (B), Cadmium (Cd), Cerium (Ce), Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe), Germanium (Ge), Hafnium (Hf), Indium (In), Iridium (Ir), Potassium (K), Lanthanum (La), Magnesium (Mg), Manganese (Mn), Molybdenum (Mo), Nickel (Ni), Neodymium (Nd), Niobium (Nb), Lead (Pb), Palladium (Pd), Platinum (Pt), Rhenium (Re), Antimony (Sb), Selenium (Se), Silicon (Si), Tin (Sn), Strontium (Sr), Tantalum (Ta), Titanium (Ti), Tellurium (Te), Thallium (Tl), Vanadium (V), Tungsten (W), Zinc (Zn) or Zirconium (Zr).

61. A multi-coated optical lens according to Claim 59, wherein the asymmetric reflectance, light absorbing coating further includes a compatible dielectric top layer or layers.

62. A multi-coated optical lens according to Claim 61, wherein the compatible dielectric layer or layers are of suitable material and thickness to provide a desired colour to the optical lens.

63. A multi-coated lens according to Claim 59, wherein the secondary coating is an abrasion-resistant or hydrophobic coating applied to the front surface or eye side surface of the optical lens.

64 ~~20~~ A multi-coated optical lens according to Claim 59, wherein the secondary coating is an anti-reflective coating applied to the front surface or eye side surface of the optical lens.

65. A multi-coated optical lens according to Claim 64, further including an abrasion-resistant coating supporting the anti-reflective coating.

66. A multi-coated optical lens according to Claim 65, wherein the abrasion-resistant coating includes an organo-silicone resin.

67. An optical lens element including

a lens wafer having

a first lens surface; and

a second lens surface,

the first or second surface having deposited thereon

an asymmetric reflectance, light absorbing coating including at least four overlapping light absorbing and generally transparent layers, and wherein the thickness

and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens when formed as a laminate optical lens; and

wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride.

68. An optical lens element according to Claim 67 wherein

the dielectric material is selected from one or more of Al_2O_3, $BaTiO_3$, Bi_2O3, B_2O_3, CeO_2, Cr_2O_3, Ga_2O_3, GeO_2, Fe_2O_3, HfO_2, In_2O_3, Indium-tin oxide, La_2O_3, MgO, Nd_2O_3, Nb_2O_5, Pr_2O_3, Sb_2O_3, Sc_2O_3, SiO, SiO_2, SnO_2, Ta_2O_5, TiO, TiO_2, Ti_2O_3, Ti_3O_5, WO_3, Y_2O_3, Yb_2O_3, ZnO, ZrO_2; AlF_3, BaF_2, CaF_2, CdF_2, CeF_3, HfF4, LaF_3, LiF, MgF_2, NaF, Na_3AlF_6, $Na_5Al_3Fl_{14}$, NdF_3, PbF_2, PrF_3, SrF_2, ThF_4, ZrF_4; Si_3N_4, AlN, or diamond-like carbon; and

the metallic material is selected from the metals, or metal nitrides of one or more of Silver (Ag), Aluminium (Al), Gold (Au), Barium (Ba), Boron (B), Cadmium (Cd), Cerium (Ce), Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe), Germanium (Ge), Hafnium (Hf), Indium (In), Iridium (Ir), Potassium (K), Lanthanum (La), Magnesium (Mg), Manganese (Mn), Molybdenum (Mo), Nickel (Ni), Neodymium (Nd), Niobium (Nb), Lead (Pb), Palladium (Pd), Platinum (Pt), Rhenium (Re), Antimony (Sb), Selenium (Se), Silicon (Si), Tin (Sn), Strontium (Sr), Tantalum (Ta), Titanium (Ti), Tellurium (Te), Thallium (Tl), Vanadium (V), Tungsten (W), Zinc (Zn) or Zirconium (Zr).

69. An optical lens element according to Claim 67, wherein the lens wafer is a front lens wafer and the asymmetric reflectance light absorbing coating is deposited on the concave contact surface of the front lens wafer.

70. An optical lens element according to Claim 67 wherein the lens wafer is a back lens wafer and the asymmetric reflectance light absorbing coating is deposited on the convex contact surface of the back lens wafer.

71. An optical lens element according to Claim 67, wherein the lens wafer is a back lens wafer and the asymmetric reflectance light absorbing coating is deposited on the concave surface of the back lens wafer.

72. An optical lens element according to Claim 67, wherein the lens wafer is a front lens wafer and the asymmetric reflectance light absorbing coating is deposited on the convex surface of the front lens wafer.

73. An optical lens element according to Claim 67, wherein a surface of the lens wafer includes a roughened area on the surface to form a mark and the asymmetric reflectance light absorbing coating is deposited on the roughened surface.

74. A laminate optical lens including

a front lens wafer including

a contact surface;

a complementary back lens wafer including

a contact surface; and

an asymmetric reflectance, light absorbing coating deposited on a contact surface, which light absorbing coating includes at least four overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens; and

wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride.

75. A laminate optical lens according to Claim 74, wherein

the dielectric material is selected from one or more of Al_2O_3, $BaTiO_3$, Bi_2O3, B_2O_3, CeO_2, Cr_2O_3, Ga_2O_3, GeO_2, Fe_2O_3, HfO_2, In_2O_3, Indium-tin oxide, La_2O_3, MgO, Nd_2O_3, Nb_2O_5, Pr_2O_3, Sb_2O_3, Sc_2O_3, SiO, SiO_2, SnO_2, Ta_2O_5, TiO, TiO_2, Ti_2O_3, Ti_3O_5, WO_3, Y_2O_3, Yb_2O_3, ZnO, ZrO_2; AlF_3, BaF_2, CaF_2, CdF_2, CeF_3, HfF4, LaF_3, LiF, MgF_2, NaF, Na_3AlF_6, $Na_5Al_3Fl_{14}$, NdF_3, PbF_2, PrF_3, SrF_2, ThF_4, ZrF_4; Si_3N_4, AlN, or diamond-like carbon; and

the metallic material is selected from the metals, or metal nitrides of one or more of Silver (Ag), Aluminium (Al), Gold (Au), Barium (Ba), Boron (B), Cadmium (Cd), Cerium

(Ce), Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe), Germanium (Ge), Hafnium (Hf), Indium (In), Iridium (Ir), Potassium (K), Lanthanum (La), Magnesium (Mg), Manganese (Mn), Molybdenum (Mo), Nickel (Ni), Neodymium (Nd), Niobium (Nb), Lead (Pb), Palladium (Pd), Platinum (Pt), Rhenium (Re), Antimony (Sb), Selenium (Se), Silicon (Si), Tin (Sn), Strontium (Sr), Tantalum (Ta), Titanium (Ti), Tellurium (Te), Thallium (Tl), Vanadium (V), Tungsten (W), Zinc (Zn) or Zirconium (Zr).

76. A laminate optical lens according to Claim 74, wherein a contact surface of the front and/or back lens wafer bears a visible mark thereon, the mark being rendered substantially invisible from the eye side of the laminate lens when the lens wafer is bonded to its complementary wafer with a laminate adhesive having a refractive index approximately equal to that of the optical lens.

77. A laminate optical lens according to Claim 76, wherein the mark is visible from the front surface of the laminate lens.

78. A laminate optical lens according to Claim 76, wherein the mark is a roughened area on the surface of the contact surface and the asymmetric reflectance light absorbing coating is deposited on the roughened contact surface.

79. A laminate optical lens according to Claim 76, wherein the asymmetric reflectance light absorbing coating includes a silica top layer, the silica top layer bearing a mark visible prior to lamination of the wafers.

80. A laminate optical lens according to Claim 79 wherein the visible mark is etched into the silica top layer.

81. A laminate optical lens according to Claim 79 wherein the visible mark is deposited on the silica top layer, the visible mark being formed from a laminate adhesive or polymeric material having a refractive index approximately equal to that of the silica layer.

82. A laminate optical lens according to Claim 74, wherein the laminated optical lens is of the semi-finished type.

83. A method for preparing an optical lens, including

a lens element; and

an asymmetric reflectance, light absorbing coating including at least four overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on

the eye side of the optical lens and a desired colour on the other side of the optical lens; and

wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride;

which method includes

providing

a lens element,

a dielectric material or materials; and

a metallic material or materials;

depositing at least four overlapping layers of dielectric material and metallic material on a surface of the optical lens element, the number and/or thickness of the respective layers being selected to provide an asymmetric reflectance, light absorbing coating.

84. A method according to Claim 83, wherein

the dielectric material is selected from one or more of Al_2O_3, $BaTiO_3$, Bi_2O3, B_2O_3, CeO_2, Cr_2O_3, Ga_2O_3, GeO_2, Fe_2O_3, HfO_2, In_2O_3, Indium-tin oxide, La_2O_3, MgO, Nd_2O_3, Nb_2O_5, Pr_2O_3, Sb_2O_3, Sc_2O_3, SiO, SiO_2, SnO_2, Ta_2O_5, TiO, TiO_2, Ti_2O_3, Ti_3O_5, WO_3, Y_2O_3, Yb_2O_3, ZnO, ZrO_2; AlF_3, BaF_2, CaF_2, CdF_2, CeF_3, HfF4, LaF_3, LiF, MgF_2, NaF, Na_3AlF_6, $Na_5Al_3Fl_{14}$, NdF_3, PbF_2, PrF_3, SrF_2, ThF_4, ZrF_4; Si_3N_4, AlN, or diamond-like carbon; and

the metallic material is selected from the metals, or metal nitrides of one or more of Silver (Ag), Aluminium (Al), Gold (Au), Barium (Ba), Boron (B), Cadmium (Cd), Cerium (Ce), Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe), Germanium (Ge), Hafnium (Hf), Indium (In), Iridium (Ir), Potassium (K), Lanthanum (La), Magnesium (Mg), Manganese (Mn), Molybdenum (Mo), Nickel (Ni), Neodymium (Nd), Niobium (Nb), Lead (Pb), Palladium (Pd), Platinum (Pt), Rhenium (Re), Antimony (Sb), Selenium (Se), Silicon (Si), Tin (Sn), Strontium (Sr), Tantalum (Ta), Titanium (Ti), Tellurium (Te), Thallium (Tl), Vanadium (V), Tungsten (W), Zinc (Zn) or Zirconium (Zr).

85. A method according to Claim 83, wherein a surface of the optical lens bears a mark and the asymmetric reflectance light absorbing coating is deposited on the surface bearing the mark, such that the mark is visible from the front surface of the optical lens, but not being visible from the eyeside thereof.

86. A method according to Claim 83, wherein the deposition step is a vacuum deposition step and is conducted in a box coater or sputter coating apparatus.

87. A method according to Claim 83, wherein the lens element includes

a front lens wafer including

a contact surface,

a complementary back lens wafer, including

a contact surface

and the overlapping layers of dielectric material and metallic material are deposited on a surface of the front and/or complementary back lens wafer.

88. A method according to Claim 87, wherein the overlapping layers of dielectric material and metallic material are deposited on a contact surface of the front or complementary back lens wafer.

89. A method according to Claim 88, wherein a laminate adhesive is applied to one or both contact surfaces, the front lens wafer and back lens wafer being brought into contact and the laminate so formed being subjected to a curing step to form a laminate optical lens.

90. A method according to Claim 89, wherein the contact surface bearing the light absorbing coating bears a visible mark thereon;

such that, when the laminate is bonded, the mark on the contact surface becomes substantially invisible to the wearer.

91. A method according to Claim 89, wherein the top layer of the light absorbing coating is a silica layer bearing a visible mark thereon;

the laminate adhesive having a similar refractive index to the silica layer such that, when the laminate is bonded, the mark on the silica surface becomes substantially invisible to the wearer.--

REMARKS

Entry of the foregoing and early and favorable consideration of the subject application is respectfully requested.

By the present amendment, claim 1 has been deleted without prejudice to or disclaimer of the subject matter contained therein. New claims 45-91 derive support from throughout the specification and claims as originally filed. No new matter has been added.

In the event that there are any questions concerning the present amendment, or the application in general, the Examiner is respectfully urged to telephone the undersigned so that prosecution of this application may be expedited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: Malcolm K. McGowan

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Date: October 25, 1999

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09/403608 09/403608
PCT/AU98/00868
430 Rec'd PCT/PTO 25 OCT 1999

COATED SUNGLASS LENS

The present invention relates to optical articles bearing a light absorbing coating.

The optical articles according to the present invention are preferably employed in the preparation of articles such as optical lenses, including spectacle lenses, including sunglass lenses, visors, shields, glass sheets, protective screens, and the like.

Sunglasses generally serve to attenuate transmitted light, but aside from the level of light transmittance, there are other features that distinguish different sunglass lenses, such as material, transmitted colour, scratch resistance, reduction of side glare, ultra-violet transmittance, cosmetic appearance etc. Coatings may be applied to enhance the performance of sunglass lenses. Such coatings might include scratch resistant coatings, hydrophobic coatings for easier cleaning, anti-reflection coatings on the concave surface for reducing side glare or "mirror" (or "interference") coatings for producing fashionable lens colours. General purpose sunglass lenses should meet certain standard specifications, including luminous transmittance, traffic signal recognition and UV transmittance (e.g. ANSI Z80.1-1995).

In addition to their performance characteristics, sunglass lenses should be simple and economical to produce in a reliable manner.

As is known in the prior art, the preferred method for producing sunglass lenses is dependent on the material involved. In all cases a light-attenuating material is either incorporated into the substrate material or applied over its surface in a process known as "tinting". For example, glass lenses are often tinted by introducing coloured additives to the molten glass, and similarly polycarbonate lenses are injection-moulded from pre-coloured plastic granules. A disadvantage associated with this method of production is that for economical reasons, very large batches of coloured raw material must be purchased , limiting flexibility in the range of tint colours that can be offered in the sunglass lens product. Moreover,

prescription sunglass lenses with highly varying thickness will also exhibit non-uniform transmittance when coloured in this way. Hard resin lenses (another commonly used ophthalmic plastic) are usually dipped in a hot, liquid dye which is imbibed into the plastic. This process also has disadvantages, such as difficulty in achieving tint uniformity, poor colour reproducibility and its requirement that if the lens has a scratch resistant coating, it must be semi-permeable to allow imbibation of the dye molecules, hence compromising the scratch resistance. If a reflective mirror coating is desired, the tinted substrate is then cleaned and coated in an evaporative box coater. Such multi-stage processes are both time-consuming and expensive.

One proposal in the prior art to overcome some of the problems associated with lens tinting is to apply the light absorbing material as a thin film on an essentially transparent substrate. United States Patent No. 5,770,259 (Parker and Soane) describes a method for tinting sunglass lenses using a curable primer containing a tinting agent. Vacuum deposition allows the light absorbing coating to be applied in a relatively fast, clean, flexible and controllable manner. United States Patent No. 5,729,323 (Arden and Cumbo) describes a sunglass formed by depositing a multi-layer light absorbing coating containing TiO_x (x=0.2-1.5) on the concave surface of the substrate. The coating is anti-reflective from the wearer's side of the lens. United States Patent No. 3679291 (Apfel and Gelber) describes a metal-dielectric multi-layer coating that is light absorbing and has an asymmetric reflectance, being anti-reflective from one side and with strong colour on the other side.

Another time-consuming step in the production of corrective sunglass lenses is the surfacing of the lenses. Corrective (or prescription) sunglass lenses are often dispensed using "semi-finished blanks" - lenses that have a pre-moulded front surface and a back surface that must be ground and polished to satisfy the individual wearer's corrective prescription. For plastic lenses in particular, tinting and the deposition of further lens coatings must be performed after surfacing the lens, resulting in a long and labour-intensive process to produce and deliver the sunglass lenses. One means to simplify and accelerate lens delivery is to employ

a wafer lamination scheme, where front and back lens wafers spanning a large range of optical powers are simply glued together to produce a lens of virtually any desired prescription. Instead of maintaining a complex optical grinding and polishing workshop, the optical dispenser need only maintain an inventory of wafers and a lamination unit. The use of fast curing glues allows lenses to be produced in only minutes. Additional performance enhancing coatings may be applied to the wafers at the factory, so that the dispenser may provide the desired product features immediately, simply by selecting the appropriate wafers from his inventory.

For laminated lens wafer systems, for example of the Sola International Matrix®-type, liquid bath tinting is not a desired option - it is a low yield process involving significant handling and possible distortion of fragile wafers. Such tinted lenses may also exhibit poor abrasion and scratch resistance and variable depth of colour.

Moreover, for sunglass lenses in particular, it would be a significant advance in the art if, in addition, reflection of visible light at the concave (or rear) lens surface could be kept sufficiently low to avoid glare from incident light at the concave surface.

Accordingly, it is an object of the present invention to overcome, or at least alleviate, one or more of the difficulties or deficiencies related to the prior art.

Accordingly, in a first aspect of the present invention there is provided an optical lens including

an optically clear lens element; and

a light absorbing coating on the front surface of the lens that

attenuates transmitted light;

has a coloured or colourless reflection as seen from the front of the sunglass lens; and

is anti-reflective as seen from the eye side of the lens.

It will be understood that, in accordance with the present invention, one or

more surfaces of an optical lens is coated with a light absorbing coating. This light absorbing coating may be applied to either the outside surface of the lens or an inside surface of a lens wafer (where it is protected from scratching once the wafers are laminated) as discussed below. The light absorbing coating may preferably serve three purposes at once - to attenuate transmitted light, effectively providing the sunglass "tint," to produce a reflected colour that is of pleasing appearance and to reduce or minimise back reflections seen by a wearer of the sunglass lenses.

In a preferred form, the light absorbing coating may function as a mirror coating. Thus, the tinting and mirror coating processes may be combined into one with this coating.

Further the deposited coating may exhibit much improved adhesion and thus improved abrasion resistance.

In a further aspect of the present invention there is provided an optical lens including

an optically clear lens element; and

a light absorbing coating on the rear surface of the lens, such that the light absorbing coating

attenuates transmitted light;

has a coloured or colourless reflection as seen from the front of the sunglass lens; and

is anti-reflective as seen from the eye side of the lens.

Preferably the light absorbing coating is an asymmetric reflectance, light absorbing coating including a plurality of overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the lens.

By the term "coloured or colourless reflection", as used herein, we mean that light from a white fluorescent source is reflected from the surface of the

optical lens to an observer such that the reflected light is coloured or white respectively.

By the term "asymmetric reflectance", as used herein, we mean that the multi-layer coating renders the lens anti-reflective when viewed from one side of the coating and exhibits a selected colour or colourless reflection when viewed from the other side.

The optically clear lens element may be a sunglass lens, ophthalmic lens element, visor or the like. A sunglass lens is preferred.

By the term "ophthalmic lens element", as used herein, we mean all forms of individual refractive optical bodies employed in the ophthalmic arts, including, but not limited to, lenses, lens wafers and semi-finished lens blanks requiring further finishing to a particular patient's prescription.

Where the optically clear lens element is an ophthalmic lens element, the ophthalmic lenses may be formed from a variety of different lens materials, and particularly from a number of different polymeric plastic resins. A common ophthalmic lens material is diethylene glycol bis (allyl carbonate). Lens materials with higher refractive indices are now growing in popularity. One such material is a CR39 (PPG Industries). Other high index lens materials are based on acrylic or allylic versions of bisphenols or allyl phthalates and the like. Other examples of lens materials that may be suitable for use with the invention include other acrylics, other allylics, styrenics, polycarbonates, vinylics, polyesters and the like.

The light absorbing coating may be formed from overlapping light absorbing and generally transparent layers, as discussed above. Desirably the light absorbing coating is formed from alternating transparent and absorbing layers.

The number and/or thickness of the light absorbing and generally transparent layers may be selected to provide an eye side anti-reflective coating utilising suitable computer software.

The combination of light absorbing and transparent layers may be selected to provide a bright, coloured reflection when viewed from the front of the lens at the same time. A mirror type coating may be produced.

The transparent layers may be formed from any suitable optically clear material. The transparent layers may be formed of a dielectric material. Preferably the dielectric layers may be formed from metal oxides, fluorides or nitrides. Metal oxides which may be used for forming transparent layers include one or more of SiO, SiO_2, ZrO_2, Al_2O_3, TiO, TiO_2, Ti_2O_3, Y_2O_3, Yb_2O_3, MgO, Ta_2O_5, CeO_2 and HfO_2. Fluorides which may be used include one or more of MgF_2, AlF_3, BaF_2, CaF_2, Na_3AlF_6, Ta_2O_5, and $Na_5Al_3Fl_{14}$. Suitable nitrides include Si_3N_4 and AlN.

A silica (SiO_2) material is preferred.

In a particularly preferred embodiment, the first deposited layer may be a silica layer followed by alternating light absorbing and generally transparent, preferably silica, layers. The transparent dielectric layers may be substantially thicker than the light absorbing or metallic layers. The first layer may be of approximately 10 to 75 nm, preferably approximately 25 to 60 nm. This first layer may provide significant improvement in the abrasion resistance of the multi-layer coating.

The generally transparent layers within the body of the light absorbing coating may be relatively thick. The thicknesses may be such as to generate interference effects which substantially cancel out internal reflections. Thicknesses of for example from approximately 20 nm to 100 nm, preferably approximately 25 nm to 85 nm may be used.

The light absorbing layers of the light absorbing coating may be formed from any suitable material. Metals, metal oxides or nitrides may be used.

Desirably a metallic layer may be selected to provide a generally neutral, e.g. grey transmission. Accordingly a silver-coloured metal, e.g. Niobium (Nb), Chromium (Cr), Tungsten (W), Tantalum (Ta), Tin (Sn), Palladium (Pd), Nickel (Ni)

or Titanium (Ti) or mixtures thereof may be used.

The thickness of the light absorbing layers is such as to attenuate transmitted light. The light absorbing or metallic layers may generally be of a substantially reduced thickness relative to the transparent or dielectric layers. For example if the material used is Niobium, the light absorbing layers may be from approximately 1 nm to 10 nm, preferably approximately 2 nm to 5 nm in thickness.

In a preferred form, the light absorbing coating may include a total of 4 to 12 alternating light absorbing-generally transparent layers, preferably 6 to 8 alternating layers. An additional primer layer may be included, as discussed above.

The resultant coating may exhibit a silver (colourless) mirror-type appearance. Alternatively the light absorbing coating may be modified to produce a different colour coating. For example a metallic oxide, e.g. silica or niobium oxide coating may be applied. A combination of dielectric top coatings may be applied., A silica top coat may be added to modify colour and additionally enhance abrasion resistance.

Accordingly in a preferred form, the light absorbing coating includes alternating layers of a dielectric material and a metallic material;

the dielectric material being selected from one or more of SiO, SiO_2, ZrO_2, Al_2O_3, TiO, TiO_2, Ti_2O_3, Y_2O_3, Yb_2O_3, MgO, Ta_2O_5, CeO_2 and HfO_2, MgF_2, AlF_3, BaF_2, CaF_2, Na_3AlF_6, Ta_2O_5 and $Na_5Al_3Fl_{14}$; and Si_3N_4 and AlN; and

the metallic material is selected from the metals, metal oxides or nitrides of one or more of Niobium (Nb), Chromium (Cr), Tungsten (W), Tantalum (Ta), Tin (Sn), Palladium (Pd), Nickel (Ni) or Titanium (Ti).

More preferably the light absorbing coating includes alternating layers of silica (SiO_2) and chromium metal.

More preferably the light absorbing coating includes an additional titanium dioxide layer or layers of such a thickness to provide a desired colour to the

optical lens.

Alternatively, the light absorbing coating includes alternating layers of silica and niobium metal.

Preferably the light absorbing coating includes an additional niobium oxide (Nb_2O_5) and/or silica (SiO_2) layer of such thicknesses to provide a desired colour to the optical lens.

In a still further preferred embodiment the light absorbing coating further includes compatible dielectric layers of suitable thickness to provide a desired colour to the optical lens.

The optical lens may further include one or more additional coatings.

Accordingly in a further aspect of the present invention there is provided a multi-coated optical lens including

an optical article; and

a light-absorbing coating deposited on at least one surface of the optically clear article; the light-absorbing coating including a plurality of overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers being selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens, and

an optically clear secondary coating which provides a desirable optical and/or mechanical property to the optical article.

The optically clear secondary coating may preferably underlay or overlay the light absorbing coating.

The secondary coating may be of any suitable type. The secondary coating may be one or more of an anti-reflective, abrasion resistant, or impact-resistant coating. An abrasion-resistant coating is preferred. The combination of an abrasion resistant coating and an anti-reflective coating is particularly

preferred.

An abrasion-resistant (hard) coating including an organosilicone resin is preferred. A typical organosilicone resin that is suitable for use in the present invention has a composition comprising one or more of the following:

1) organosilane compounds with functional and/or non-functional groups such as glycidoxypropyl trimethoxy silane;
2) co-reactants for functional groups of functional organosilanes, such as organic epoxies, amines, organic acids, organic anhydrides, imines, amides, ketamines, acrylics, and isocyanates; colloidal silica, sols and/or metal and non-metal oxide sols; catalysts for silanol condensation, such as dibutylin dilaurate;
3) solvents such as water, alcohols, and ketones;
4) other additives, such as fillers.

Abrasion resistant coats of acrylic, urethane, melamine, and the like may also be used. These materials, however, frequently do not have the good abrasion resistant properties of organo-silicone hard coatings.

The abrasion-resistant (hard) coating may be coated by conventional methods such as dip coating, spray coating, spin coating, flow coating and the like or by newer methods such as Plasma Enhanced Chemical Vapour Deposition. Coating thicknesses of between approximately 0.5 and 10 microns are preferred for abrasion and other properties.

The secondary abrasion resistant coating may be applied to the front and/or rear lens surfaces. The abrasion resistant coating may be of the type described in United States Patent 4,954,591 to the Applicants, the entire disclosure of which is incorporated herein by reference.

In a preferred aspect, one or both surfaces of the optical article may be subjected to a surface treatment to improve bondability and/or compatibility of the light absorbing and/or secondary coating. The surface treatment may be selected from one or more of the group consisting of plasma discharge, corona discharge,

glow discharge, ionising radiation, UV radiation, flame treatment and laser, preferably excimer laser treatment. A plasma discharge treatment is preferred. The surface treatment, alternatively or in addition, may include incorporating another bonding layer, for example a layer including a metal or metal compound selected from the group consisting of one or more of Chromium, Nickel, Tin, Palladium, Silicon, and/or oxides thereof.

The optical article may be a sunglass lens of the wrap-around or visor type, for example of the type described in International Patent Application PCT/AU97/00188 "Improved Single Vision Lens" to Applicants, the entire disclosure of which is incorporated herein by reference.

In a further aspect of the present invention, there is provided a method for preparing an optical lens, which method includes

providing

an optically clear lens element; and

a light absorbing coating on the front surface of the lens that

attenuates transmitted light;

has a coloured or colourless reflection as seen from the front of the sunglass lens; and

is anti-reflective as seen from the eye side of the lens; and

depositing the light absorbing coating on a surface of the optical lens element.

According to the present invention it has been found that, following the method mentioned above, it is possible to achieve a relatively thin, light absorbing coating with consequent advantages in both optical and mechanical properties.

Preferably the method further includes

providing

an optically clear lens element,

a light absorbing material, and

a generally transparent material;

depositing overlapping layers of light absorbing material and generally

transparent material on a surface of the optical lens element, the number and/or thickness of the respective layers being selected to provide a desired colour to the front surface of the optical lens and an anti-reflective effect on the eye side of the optical lens.

In a preferred aspect the light absorbing or metallic material and generally transparent or dielectric material, preferably Nb and SiO_2 or Cr and SiO_2, are deposited as alternating layers.

The deposition step may be a vacuum deposition step. The deposition step may be conducted in a coating apparatus. A box coater or sputter coater may be used.

The light absorbing coating may preferably be formed on the surfaces of the substrate according to the process and the box coaters as described in the Italian Patent No. 1.244.374 the entire disclosure of which is incorporated herein by reference.

In accordance with said method, the various layers of the light absorbing coating may be deposited in subsquent steps utilising a vacuum evaporation technique and exposing the growing layers to a bombardment of a beam of ions of inert gas.

Moreover, in accordance with the preferred method, the deposition of the layers may be achieved at a low temperature (generally below 80°C), using an ion beam having a medium intensity (meaning the average number of ions that reach the substrate) included beween approximately 30 and 100 µA/cm2 and the energy included between approximately 50 and 100 eV.

Preferably, the optical article is maintained at an elevated temperature during the deposition of the various layers of the light absorbing coating.

More preferably the optically clear lens element includes
a front lens wafer including

a contact surface,

a complementary back lens wafer, including

a contact surface

and the overlapping layers of light absorbing material and generally transparent material are deposited on a surface of the front and/or complementary back lens wafer.

A laminate adhesive may be applied to one or both contact surfaces, the front lens wafer and back lens wafer being brought into contact and the laminate so formed being subjected to a curing step to form a laminate optical lens.

In a further preferred aspect of the present invention, there is provided an optical lens element including

a lens wafer having

a first lens surface; and

a second lens surface,

the first or second surface having deposited thereon

a light absorbing coating that

attenuates transmitted light;

has a coloured or colourless reflection as seen from the front of the sunglass lens; and

is anti-reflective as seen from the eye side of the lens.

Preferably the light absorbing coating is an asymmetric reflectance light absorbing coating including a plurality of overlapping light absorbing and generally transparent layers; the thickness and/or number of the respective layers being selected to provide a desired colour to the optical lens element and an anti-reflective effect on the eye side of the lens element after lamination of the lens wafer.

The coated lens wafer may be a front surface wafer or a rear surface wafer. Where the coated lens wafer is a front surface wafer the light absorbing coating may be deposited on the first (front) or second (rear) lens surface thereof.

Where the coated lens wafer is a rear surface wafer, the light absorbing coating is preferably deposited on the first (front) surface thereof.

Accordingly in a still further aspect of the present invention, there is provided a laminate optical lens including

a front lens wafer including

a contact surface;

a complementary back lens wafer including

a contact surface; and

a light absorbing coating deposited on a contact surface, which light absorbing coating

attenuates transmitted light;

has a coloured or colourless reflection as seen from the front of the sunglass lens; and

is anti-reflective as seen from the eye side of the lens.

Preferably the light absorbing coating includes a plurality of overlapping light absorbing and generally transparent layers; the thickness and/or number of the respective layers being selected to provide a desired colour to the laminate optical lens and an anti-reflective effect on the eye side of the laminate optical lens, as discussed above.

It will be understood that, in this embodiment, in addition to the advantages of the present invention described above, the light absorbing coating provided may be protected by the optical lens wafers themselves and is thus virtually indestructible.

In addition, abrasion resistant and like coatings of the type described above may be applied to the external surfaces of the laminate optical article.

The laminate optical article may be fabricated in a manner similar to that described in International Patent Application PCT/AU96/00805, "Laminate Article", to Applicants, the entire disclosure of which is incorporated herein by reference.

Where the light absorbing coating is applied inside the laminate, particularly for hard resin lenses, because the lens is not tinted in a liquid bath, the scratch resistant coating applied to the exterior of the wafers does not need to be semi-permeable (to allow passage of the tint molecules through to the substrate). Therefore, the most durable, non-tintable scratch resistant coatings may be applied and the final product is extremely durable. The light absorbing coating is protected inside the laminate and cannot be scratched. Because the light absorbing coating is located approximately in the centre of the laminate, when the lens is edged for mounting into spectacle frames, the edges appear "dark" and it is difficult to discern that the "tinted" appearance of the lens is due only to a very thin coating. Finally, as can be seen in Figure 2 below, there is a double reflection from the front of the lens, one "white" reflection from the front of the front wafer and one coloured reflection from the light absorbing coating inside the laminate. If the front wafer is thin and has no optical power, the two reflections overlay one another and only a single reflection is observed. However, if the front wafer is thick and has surfaces of different curvature, then the two front reflections become apparent. A quite pleasing "glossy" effect is obtained.

Before the lens wafers of the laminate lens are bonded, they may be too thin to meet United States F.D.A impact requirements. A sunglass wearer may be put at risk if he wears sunglasses which have been made using only the front or back wafer of the laminate. It may be necessary for a prescription sunglass manufacturer to ensure that non-laminated wafers are not mounted in sunglass frames for general use. One way to achieve this end is to ensure that the lens wafers are visibly identified with a warning symbol as unsuitable for use, in such a way that after the wafers are laminated, the warning is no longer visible. For example, the current Matrix® lens lamination system includes a warning symbol in the centre of the contact surface of each lens wafer - a roughened area of the surface that causes unacceptable disturbance of the wearer's vision and thus effectively prevents use of non-laminated wafers alone in spectacles. However, when the wafers are laminated using an adhesive of refractive index suitably matched to the lens material, the interface corresponding to the roughened surfaces optically disappears, so that the warning symbol is no longer visible.

If the light absorbing coating is applied over such a roughened contact surface, it is visible from the front of the wafer. It is also visible from the back of the wafer, because until the wafer is laminated, it is exposed to air rather than another lens wafer, so the coating does not perform antireflectively as designed. The roughened surface causes substantial light scattering toward the wearer and significantly disturbs his vision, so much so that the front lens wafer would not conceivably be used in a non-laminated state as a sunglass lens. After lamination, the coating is antireflective when viewed from the rear - light scattering from the roughened surface is very weak and so the roughened area is invisible to the wearer. If the contact surface of the lens wafer is roughened in a cosmetically pleasing fashion, then not only are non laminated lens wafers clearly identified, but after the coated wafers are laminated, a logo that is visible from the front of the lens but yet does not disturb the wearer's vision results.

Accordingly, in a preferred embodiment of the present invention a contact surface of the front and/or back lens wafer bears a mark thereon, the mark being substantially visible from both sides of the wafer before lamination, but which becomes substantially invisible from the eye side of the finished laminate lens. Preferably the mark on the contact surface is visible from the front of the laminated lens.

In an alternative embodiment where the mark on the contact surface is not visible from the front of the final laminated lens, the light absorbing coating includes a silica top layer, the silica top layer bearing a mark visible prior to lamination, as discussed above.

Preferably the visible mark is rendered substantially invisible when the lens wafer is contacted with a laminate adhesive having a refractive index approximately equal to that of the silica layer.

The light absorbing coating may for example be purposefully constructed to have a top layer of silica, which has a refractive index of approximately n=1.47. An excimer laser or other etching technique can be applied to remove (or merely reduce the thickness of) the top silica layer of part of the coating in the form of a

warning label, which will be very visible before the wafer is laminated. However, after lamination, glue will fill the depressions caused by the etching, and because the glue can be chosen to have a refractive index very close to that of silica, the etched markings will have no optical effect and hence disappear, making the laminated lens suitable for use.

Alternatively, instead of removing part of the top silica layer, a warning label may be deposited on top of the silica layer with a suitably index-matched material, for example an adhesive or polymer material. Again, after lamination, glue will fill the void around the raised warning label, and because the glue can be chosen to have a refractive index very close to that of silica and the label itself, the warning marking will have no optical effect and hence disappear, making the laminated lens suitable for use.

Further characteristics and advantages of the present invention will be apparent from the following description of drawings and examples of embodiments of the present invention, given as indicative but not restrictive.

In the figures:

Figure 1 illustrates an embodiment of a sunglass lens according to the present invention with the light absorbing coating inside the laminate.

Figure 2 illustrates the attenuation of transmitted light through the sunglass lens of Figure 1 from a forward light source.

Figure 3 illustrates the attenuation of reflected light from the sunglass lens of Figure 1 from side glare.

Figure 4 illustrates the transmission spectra of a "black" laminated lens (see Table 1), as compared to a typical liquid-dye tinted hard resin sunglass lens.

Figure 5 illustrates an embodiment of a laminated sunglass lens with semi-visible internal markings.

Figure 6 illustrates an embodiment of a sunglass lens according to the present invention with the light absorbing coating on the outside surface of the front wafer.

Figure 7 illustrates the attenuation of transmitted light through the sunglass lens of Figure 6 from a forward light source.

Figure 8 illustrates the attenuation of reflected light from the sunglass lens of Figure 6 from side glare.

Figure 9 illustrates an embodiment of a sunglass lens according to the present invention with the light absorbing coating on the outside surface of the back wafer.

Figure 10 illustrates the attenuation of transmitted light through the sunglass lens of Figure 9 from a forward light source.

Figure 11 illustrates the attenuation of reflected light from the sunglass lens of Figure 8 from side glare.

EXAMPLE 1

Light absorbing coating on the inside of a laminated lens

Figure 1 shows a preferred embodiment of a tinted optical lens according to the present invention. The front and back lens wafers are hard resin plastic wafers from a commercial ophthalmic lens system (Sola International Matrix® system). The back lens wafer is supplied with its external surface pre-coated with a scratch resistant and anti-reflective coating. The external surface of the front wafer is also treated with a scratch resistant coating. The internal surfaces of both wafers are of uncoated hard resin.

A light absorbing coating with asymmetric reflectance is applied to the interface surface of the front wafer. (It may equally well be applied to the internal

surface of the back wafer instead. Only the first case will be discussed for simplicity.) The coating is designed so that when the wafers are laminated, neutral attenuation of transmitted light, an aesthetically pleasing colour when viewed from the front of the lens and anti-reflection from the wearer-side of the lens result, as shown in Figures 2 and 3. Referring to Figure 3, it will be appreciated that possible reflections from surfaces behind the light absorbing coating do not contribute in any significant manner, because their intensity is severely reduced by the incident light having initially passed through the light absorbing coating. Such reflections are therefore not indicated in the figure.

The multi-layer light absorbing coatings consist of layers of absorbing materials and transparent dielectrics. The layers of absorbing material provide the attenuation of transmitted light. The degree of attenuation is controlled by adjusting the total thickness of these layers. If the absorbing material has a neutral transmission spectrum (as do many metals), the transmission of the coating will also be neutral, which is highly desirable for a sunglass lens that does not distort colour vision. By appropriately selecting the thicknesses of the various layers (which today is commonly achieved with the aid of computer software packages), the reflectance of the coating may be designed to have the required properties of a pleasing colour when viewed from the front of the lens and anti-reflection from the wearer side.

Table 1 lists the materials and layer thicknesses used in three differently coloured embodiments of the light absorbing coating. The coatings were deposited using a commercial evaporative box coater (Satis 1200).

TABLE 1

Layers			Thickness (nm)		
Number	Material	Primary function	Bronze	Blue	Black
Substrate					
1	Cr	Adhesion to substrate	0.5	0.5	0.5
2	TiO_2	Front colour	37	35	20
3	SiO_2	Front colour	9	50	20
4	TiO_2	Front colour	88	-	20
5	Cr	Absorption	14	12	12
6	SiO_2	Back AR	65	65	65
7	Cr	Absorption	9	9	9
8	SiO_2	Back AR	85	85	85
9	Cr	Absorption	2.5	2.5	2.5
10	SiO_2	Scratch resistance	5	5	5

Table 1. Composition of three differently coloured embodiments of the light absorbing coating as deposited inside the laminated sunglass lens.

The sequence of layers is relative to a light ray entering the front surface of the optical lens.

Table 2 shows the optical performance of the sunglass lenses in transmittance.

TABLE 2

Transmission	Bronze	Blue	Black
Luminous transmittance (%)	12.1	11.4	13.5
CIE x coordinate (illum. C)	0.36	0.38	0.37
CIE y coordinate (illum. C)	0.35	0.37	0.35
Av. UVB transmittance (%)	0	0	0
Av. UVA transmittance (%)	1.8	1.4	2.2
Red traffic signal trans. (%)	16.3	16.3	18.1
Yellow traffic signal trans. (%)	13.6	13.3	15.3
Green traffic signal trans. (%)	11.1	10.1	12.3
ANSI Standard Z80.3 - 1997	yes	yes	yes

Table 2. Optical performance of the sunglass lenses in transmission.

As shown in Figure 4, where the transmission spectrum of the black-coloured sunglass lens is compared to a hard resin sunglass lens tinted by the traditional liquid dye tinting process, the light absorbing coating has a quite neutral transmission, which provides excellent colour vision.

Table 3 shows the reflectance characteristics of the laminated sunglass lenses. As seen from the wearer-side reflectances, the sunglass lenses are indeed quite anti-reflective of side glare.

TABLE 3

Sunglass lens reflectance	Bronze	Blue	Black
Front side			
Luminous reflectance (%)	8.6	15.8	4.5
CIE coordinate (illuminant C), x	0.36	0.23	0.26
CIE coordinate (illuminant C), y	0.35	0.23	0.24
Wearer side			
Luminous reflectance (%)	0.9	1.0	1.1
CIE coordinate (illuminant C), x	0.30	0.25	0.26
CIE coordinate (illuminant C), y	0.31	0.24	0.29

Table 3. Optical performance of the sunglass lenses in reflection.

EXAMPLE 2

In the embodiment of the present invention illustrated in Example 1 (with the light absorbing coating inside the laminate), it is possible to produce semi-visible markings or logos on the sunglass lenses, as shown in Figure 5. By artificially roughening the surface of the wafer on the interface surface underneath the light absorbing coating (for example by etching the mould from which the internal surface of the front wafer is cast in this case), patterns are created and embedded inside the lens after lamination. The roughened surface is visible from the front of the sunglass lens, because from this side of the light absorbing coating, the reflectance is non-negligible, so light is scattered from the roughened surface. From the wearer side, because the coating is anti-reflective, reflections from the roughened surface are extremely weak, so that the markings are almost impossible to see. Therefore the logo can even be placed in the optical centre of the lens without disturbing the wearer's vision.

EXAMPLE 3

Light absorbing coating on the outside surface of the front wafer of a laminated lens

Figure 6 shows another preferred embodiment of the sunglass lens. Again, the front and back lens wafers are hard resin plastic wafers from a commercial ophthalmic lens system (Sola International Matrix® system). The back wafer is supplied with its external surface pre-coated with a scratch resistant and anti-reflective coating. The external surface of the front wafer is also treated with a scratch resistant coating. The internal surfaces of both wafers are of uncoated hard resin.

In this embodiment, the light absorbing coating with asymmetric reflectance is applied to the outside surface of the front wafer. Neutral attenuation of transmitted light, an aesthetically pleasing colour when viewed from the front of the lens and anti-reflection from the wearer-side of the lens again result after the wafers are laminated, as shown in Figures 7 and 8.

Table 4 lists the materials and approximate layer thicknesses used in four differently coloured embodiments of the light absorbing coating. The coatings in this case were deposited using a thin film sputter deposition system.

TABLE 4

Layers			Thickness (nm)			
Number	Material	Primary function	Silver	Gold	Blue	Copper
Substrate						
1	SiO_2	Scratch resistance	50	50	50	50
2	Nb	Absorption	2	2	2	2
3	SiO_2	Back AR	80	80	80	80
4	Nb	Absorption	4	4	4	4
5	SiO_2	Back AR	80	80	65	65
6	Nb	Absorption	4	4	4	4
7	SiO_2	Back AR	40	40	20	40
8	Nb	Absorption	4	4	4	4
9	SiO_2	Back AR, front colour		10	40	10
10	Nb_2O_5	Front colour		10	30	30
11	SiO_2	Front colour	25	30	30	60

Table 4. Composition of four differently coloured embodiments of the light absorbing coating as deposited on the outside surface of the front lens wafer.

Table 5 shows the optical performance of the sunglass lenses in transmittance.

TABLE 5

Transmission	Silver	Gold	Blue	Copper
Luminous transmittance (%)	13.2	15.8	17.6	21.8
CIE x coordinate (illum. C)	0.33	0.33	0.36	0.33
CIE y coordinate (illum. C)	0.33	0.33	0.36	0.34
Av. UVB transmittance (%)	0.0	0.0	1.0	0.3
Av. UVA transmittance (%)	1.3	1.3	2.2	4.8
Red traffic signal trans. (%)	15.2	18.0	22.3	24.8
Yellow traffic signal trans. (%)	14.0	16.6	19.5	23.0
Green traffic signal trans. (%)	12.7	15.3	16.3	21.1
ANSI Standard Z80.3 - 1997	yes	yes	yes	yes.

Table 5. Optical performance of the sunglass lenses in transmission.

Table 6 shows the reflectance characteristics of the laminated sunglass lenses. As seen from the wearer-side reflectances, the sunglass lenses are indeed quite anti-reflective of side glare.

TABLE 6

Sunglass lens reflectance	Silver	Gold	Blue	Copper
Front side				
Luminous reflectance (%)	15.4	11.0	17.8	5.6
CIE coordinate (illuminant C), x	0.32	0.35	0.23	0.35
CIE coordinate (illuminant C), y	0.33	0.37	0.23	0.34
Wearer side				
Luminous reflectance (%)	0.98	1.3	1.2	1.8
CIE coordinate (illuminant C), x	0.22	0.23	0.22	0.24
CIE coordinate (illuminant C), y	0.20	0.21	0.25	0.22

Table 6. Optical performance of the sunglass lenses in reflection.

EXAMPLE 4

Light absorbing coating on the outside surface of the back wafer of a laminated lens

In the embodiment the light absorbing coating is deposited on the outside surface of the back wafer as in Figure 9. In this embodiment of the present invention, no additional anti-reflective coating is required to minimise all back reflections to the eye of the wearer, as seen in Figure 11. It will be appreciated that possible reflections from surfaces behind the light absorbing coating do not contribute in any significant manner, because their intensity is severely reduced by the incident light having initially passed through the light absorbing coating. Such reflections are therefore not indicated in the figure.

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CLAIMS

1. An optical lens including

an optically clear lens element; and

an asymmetric reflectance, light absorbing coating including at least four overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens; and

wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride;

2. An optical lens according to Claim 1, wherein

the dielectric material is selected from one or more of SiO, SiO_2, ZrO_2, Al_2O_3, TiO, TiO_2, Ti_2O_3, Y_2O_3, Yb_2O_3, MgO, Ta_2O_5, CeO_2 and HfO_2, MgF_2, AlF_3, BaF_2, CaF_2, Na_3AlF_6, Ta_2O_5 and $Na_5Al_3Fl_{14}$, and Si_3N_4 and AlN; and

the metallic material is selected from the metals, or metal nitrides of one or more of Niobium (Nb), Chromium (Cr), Tungsten (W), Tantalum (Ta), Tin (Sn), Palladium (Pd), Nickel (Ni) or Titanium (Ti).

3. An optical lens according to Claim 1, wherein the asymmetric reflectance, light absorbing coating further includes compatible dielectric layers of suitable thickness to provide a desired colour to the optical lens.

4. An optical lens according to Claim 1, wherein the asymmetric reflectance, light absorbing coating further includes a compatible dielectric top layer to enhance abrasion resistance.

5. An optical lens including

an optically clear lens element; and

an asymmetric reflectance, light absorbing coating including at least four alternating layers of silica (SiO2) and chromium (Cr) or Niobium (Nb) metal; and wherein the thickness and/or number of the respective layers are selected to

provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens.

6. An optical lens according to Claim 5, wherein the asymmetric reflectance, light absorbing coating includes an additional titanium dioxide layer or layers of such a thickness to provide a desired colour to the optical lens.

7. An optical lens according to Claim 5, wherein the asymmetric reflectance, light absorbing coating includes alternating layers of silica and niobium metal and an additional niobium oxide (Nb_2O_5) and/or silica (SiO_2) layer of such thicknesses to provide a desired colour to the optical lens.

8. An optical lens according to Claim 1, wherein a surface of the lens is subjected to a surface treatment.

9. An optical lens according to Claim 8, wherein the surface treatment improves adhesion thereto.

10. An optical lens according to Claim 9, wherein a surface is subjected to a plasma treatment.

11. An optical lens according to Claim 9, wherein an adhesion promoting coating is applied to a surface.

12. An optical lens according to Claim 1, wherein the optically clear lens element is a laminate optical lens.

13. A multi-coated optical lens including

an optically clear lens element;

an asymmetric reflectance, light absorbing coating including a plurality of overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the lens;

wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride;

an optically clear secondary coating which provides a desirable optical and/or mechanical property to the optical lens.

14. A multi-coated optical lens according to Claim 13, wherein

the dielectric material is selected from one or more of SiO, SiO_2, ZrO_2, Al_2O_3, TiO, TiO_2, Ti_2O_3, Y_2O_3, Yb_2O_3, MgO, Ta_2O_5, CeO_2 and HfO_2, MgF_2, AlF_3, BaF_2, CaF_2, Na_3AlF_6, Ta_2O_5 and $Na_5Al_3Fl_{14}$, and Si_3N_4 and AlN; and

the metallic material is selected from the metals or metal nitrides of one or more of Niobium (Nb), Chromium (Cr), Tungsten (W), Tantalum (Ta), Tin (Sn), Palladium (Pd), Nickel (Ni) or Titanium (Ti).

15. A multi-coated optical lens according to claim 14, wherein the asymmetric reflectance, light absorbing coating further includes compatible dielectric layers of suitable thickness to provide a desired colour to the optical lens.

16. A multi-coated optical lens according to claim 14, wherein the asymmetric reflectance, light absorbing coating further includes a compatible dielectric top layer to enhance abrasion resistance.

17. A multi-coated optical lens according to Claim 13, wherein the secondary coating is an abrasion-resistant coating applied to the front surface or eye side surface of the optical lens.

18. A multi-coated optical lens according to Claim 13, wherein the optically clear secondary coating is an anti-reflective coating applied to the front surface or eye side surface of the optical lens.

19. A multi-coated optical lens according to Claim 18, further including an abrasion-resistant coating supporting the anti-reflective coating.

20. A multi-coated optical lens according to Claim 19, wherein the abrasion-

resistant coating includes an organo-silicone resin.

21. An optical lens element including
a lens wafer having
a first lens surface; and
a second lens surface,
the first or second surface having deposited thereon
an asymmetric reflectance, light absorbing coating including at least four overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens when formed as a laminate optical lens; and
wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride.

22. An optical lens element according to Claim 21 wherein
the dielectric material is selected from one or more of SiO, SiO_2, ZrO_2, Al_2O_3, TiO, TiO_2, Ti_2O_3, Y_2O_3, Yb_2O_3, MgO, Ta_2O_5, CeO_2 and HfO_2, MgF_2, AlF_3, BaF_2, CaF_2, Na_3AlF_6, Ta_2O_5 and $Na_5Al_3Fl_{14}$, and Si_3N_4 and AlN; and
the metallic material is selected from the metals or metal nitrides of one or more of Niobium (Nb), Chromium (Cr), Tungsten (W), Tantalum (Ta), Tin (Sn), Palladium (Pd), Nickel (Ni) or Titanium (Ti).

23. An optical lens element according to Claim 21, wherein the lens wafer is a front lens wafer and the asymmetric reflectance light absorbing coating is deposited on the concave surface of the front lens wafer.

24. An optical lens element according to Claim 21 wherein the lens wafer is a back lens wafer and the asymmetric reflectance light absorbing coating is deposited on the convex surface of the back lens wafer.

25. An optical lens element according to Claim 21, wherein the lens wafer is a back lens wafer and the asymmetric reflectance light absorbing coating is

deposited on the concave surface of the back lens wafer.

26. An optical lens element according to Claim 21, wherein the lens wafer is a front lens wafer and the asymmetric reflectance light absorbing coating is deposited on the convex surface of the front lens wafer.

27. A laminate optical lens including

a front lens wafer including

a contact surface;

a complementary back lens wafer including

a contact surface; and

an asymmetric reflectance, light absorbing coating deposited on a contact surface, which light absorbing coating includes at least four overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens; and

wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride.

28. A laminate optical lens according to Claim 27, wherein

the dielectric material is selected from one or more of SiO, SiO_2, ZrO_2, Al_2O_3, TiO, TiO_2, Ti_2O_3, Y_2O_3, Yb_2O_3, MgO, Ta_2O_5, CeO_2 and HfO_2, MgF_2, AlF_3, BaF_2, CaF_2, Na_3AlF_6, Ta_2O_5 and $Na_5Al_3Fl_{14}$, and Si_3N_4 and AlN; and

the metallic material is selected from the metals, or metal nitrides of one or more of Niobium (Nb), Chromium (Cr), Tungsten (W), Tantalum (Ta), Tin (Sn), Palladium (Pd), Nickel (Ni) or Titanium (Ti).

29. A laminate optical lens according to Claim 27, wherein a contact surface of the front and/or back lens wafer bears a mark thereon, the mark not being visible from the eye side of the laminate lens.

30. A laminate optical lens according to Claim 29, wherein the mark on the

contact surface is visible from the front surface of the laminate lens.

31. An optical lens element according to Claim 27, wherein the light absorbing coating is deposited on a contact surface and includes a silica top layer, the silica top layer bearing a mark visible prior to lamination.

32. An optical lens element according to Claim 31 wherein the visible mark is etched into the silica top layer.

33. An optical lens element according to Claim 32, wherein the visible mark is rendered substantially invisible from the eye side of the laminate lens when the lens wafer is bonded to its complementary wafer with a laminate adhesive having a refractive index approximately equal to that of the silica layer.

34. An optical lens element according to Claim 31 wherein the visible mark is deposited on the silica top layer, the visible mark being formed from a laminate adhesive or polymeric material having a refractive index approximately equal to that of the silica layer.

35. An optical lens element according to Claim 34, wherein the visible mark is rendered substantially invisible from the eye side of the laminate lens when the lens wafer is bonded to its complementary wafer with a laminate adhesive having a refractive index approximately equal to that of the silica layer.

36. A method for preparing an optical lens, including

an optically clear lens element; and

an asymmetric reflectance, light absorbing coating including at least four overlapping light absorbing and generally transparent layers, and wherein the thickness and/or number of the respective layers are selected to provide an anti-reflective effect on the eye side of the optical lens and a desired colour on the other side of the optical lens; and

wherein the asymmetric reflectance, light absorbing coating includes alternating layers of a dielectric material and a metallic material which is a metal or metal nitride;

which method includes

providing

an optically clear lens element,

a dielectric material; and

a metallic material;

depositing at least four overlapping layers of dielectric material and metallic material on a surface of the optical lens element, the number and/or thickness of the respective layers being selected to provide an asymmetric reflectance, light absorbing coating.

37. A method according to Claim 36, wherein

the dielectric material is selected from one or more of SiO, SiO_2, ZrO_2, Al_2O_3, TiO, TiO_2, Ti_2O_3, Y_2O_3, Yb_2O_3, MgO, Ta_2O_5, CeO_2 and HfO_2, MgF_2, AlF_3, BaF_2, CaF_2, Na_3AlF_6, Ta_2O_5 and $Na_5Al_3Fl_{14}$, and Si_3N_4 and AlN; and

the metallic material is selected from the metals, or metal nitrides of one or more of Niobium (Nb), Chromium (Cr), Tungsten (W), Tantalum (Ta), Tin (Sn), Palladium (Pd), Nickel (Ni) or Titanium (Ti);

38. A method according to Claim 36, wherein the deposition step is a vacuum deposition step and is conducted in a box coater or sputter coating apparatus.

39. A method according to Claim 36, wherein the optically clear lens element includes

a front lens wafer including

a contact surface,

a complementary back lens wafer, including

a contact surface

and the overlapping layers of dielectric material and metallic material are deposited on a surface of the front and/or complementary back lens wafer.

40. A method according to Claim 39, wherein the overlapping layers of dielectric material and metallic material are deposited on a contact surface of the front or complementary back lens wafer.

41. A method according to Claim 39, wherein a laminate adhesive is applied to one or both contact surfaces, the front lens wafer and back lens wafer being brought into contact and the laminate so formed being subjected to a curing step to form a laminate optical lens.

42. A method according to claim 41, wherein the contact surface bearing the light absorbing coating bears a visible mark thereon;

the laminate adhesive having a similar refractive index to the silica layer such that, when the laminate is bonded, the mark on the contact surface becomes substantially invisible to the wearer.

43. A method according to Claim 41, wherein the top layer of the light absorbing coating is a silica layer bearing a visible mark thereon;

the laminate adhesive having a similar refractive index to the silica layer such that, when the laminate is bonded, the mark on the silica surface becomes substantially invisible to the wearer.

44. An optical lens according to Claim 1, substantially as hereinbefore described with reference to any one of the examples.

PCT

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International Bureau

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(54) Title: COATED SUNGLASS LENS

(57) Abstract

An optical lens including an optically clear lens element; and a light absorbing coating on a surface of the lens that attenuates transmitted light; has a coloured or colourless reflection as seen from the front of the sunglass lens; and is anti–reflective as seen from the eye side of the lens.

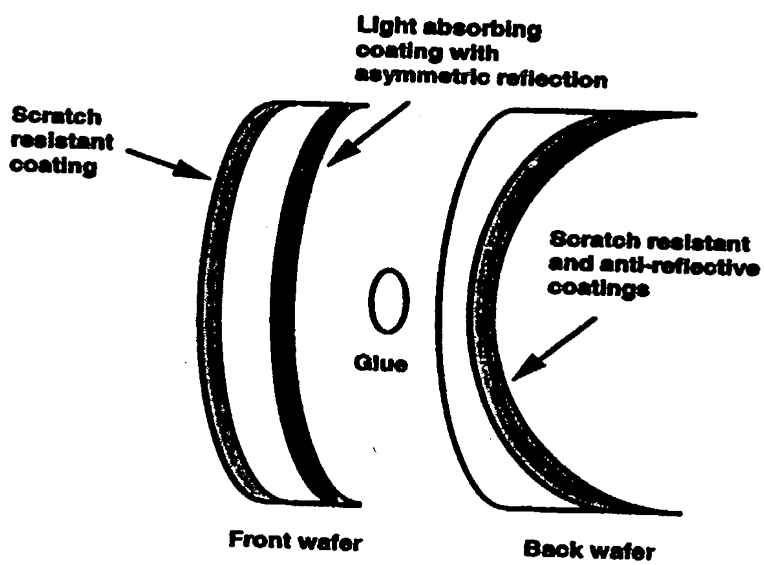


FIGURE 1

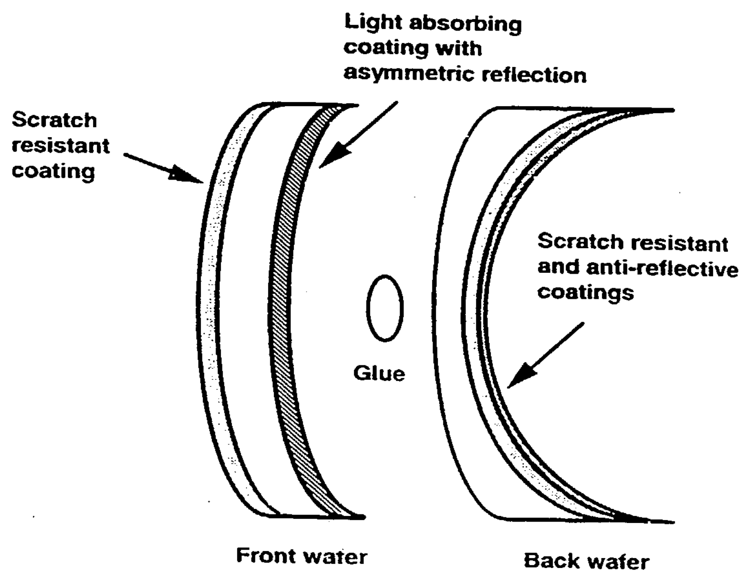

Light absorbing coating with asymmetric reflection
Scratch resistant coating
Scratch resistant and anti-reflective coatings
Glue
Front wafer
Back wafer

FIGURE 2

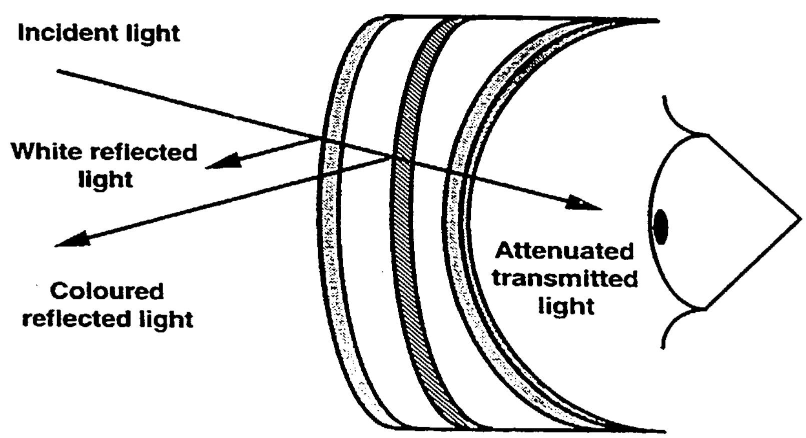

Incident light
White reflected light
Coloured reflected light
Attenuated transmitted light

FIGURE 3

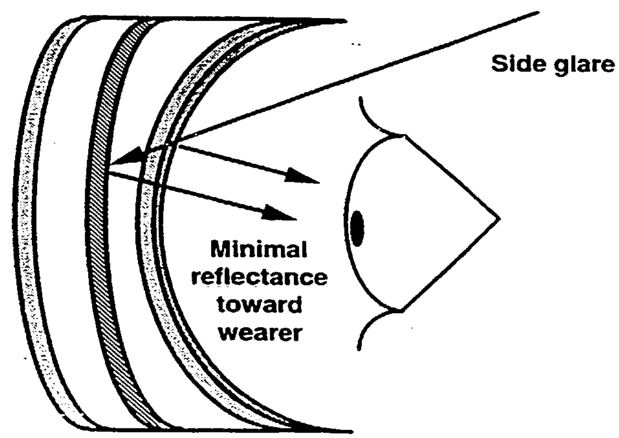


FIGURE 4

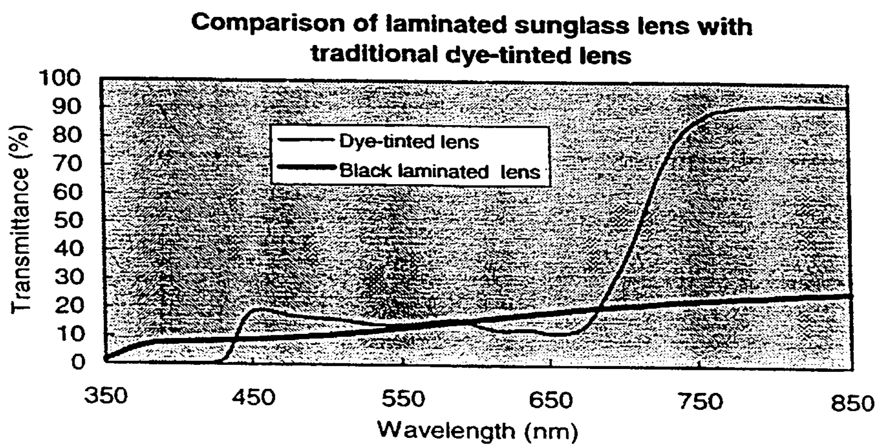

Comparison of laminated sunglass lens with traditional dye-tinted lens
Dye-tinted lens
Black laminated lens
Transmittance (%)
100
90
80
70
60
50
40
30
20
10
0
350
450
550
650
750
850
Wavelength (nm)

FIGURE 5

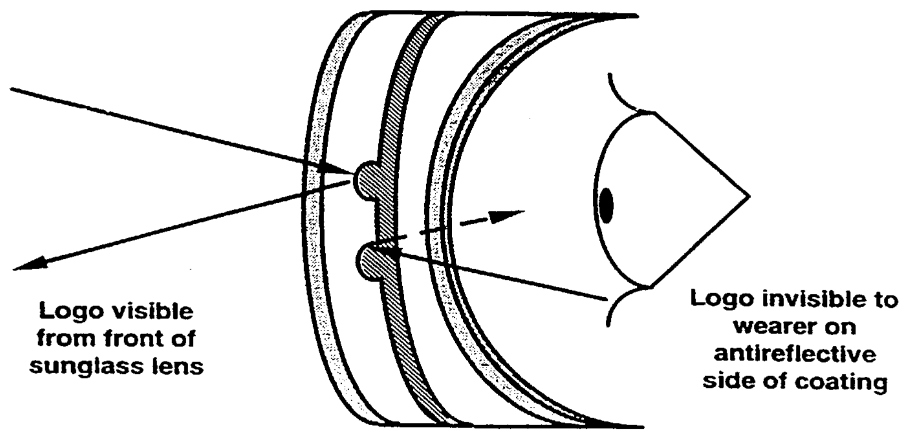

Logo visible from front of sunglass lens
Logo invisible to wearer on antireflective side of coating

FIGURE 6

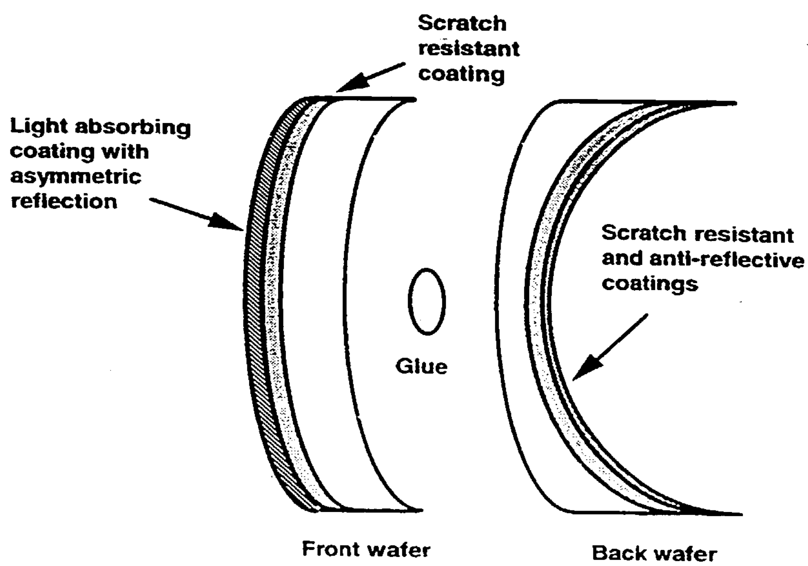

Scratch resistant coating
Light absorbing coating with asymmetric reflection
Glue
Scratch resistant and anti-reflective coatings
Front wafer
Back wafer

FIGURE 7

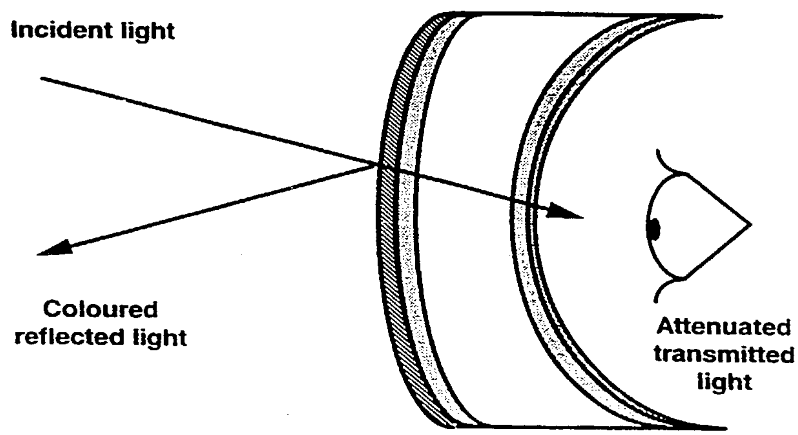

Incident light
Coloured reflected light
Attenuated transmitted light

FIGURE 8

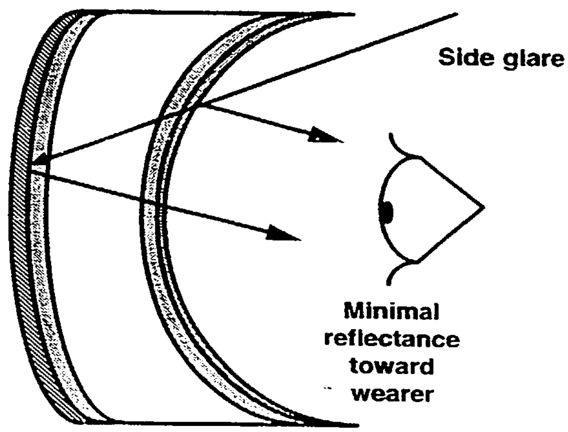


FIGURE 9

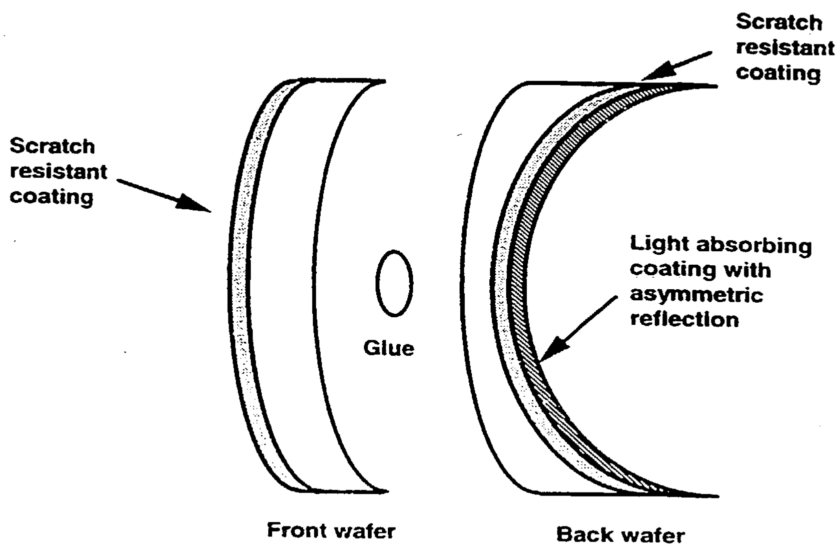

Scratch resistant coating
Scratch resistant coating
Light absorbing coating with asymmetric reflection
Glue
Front wafer
Back wafer

FIGURE 10

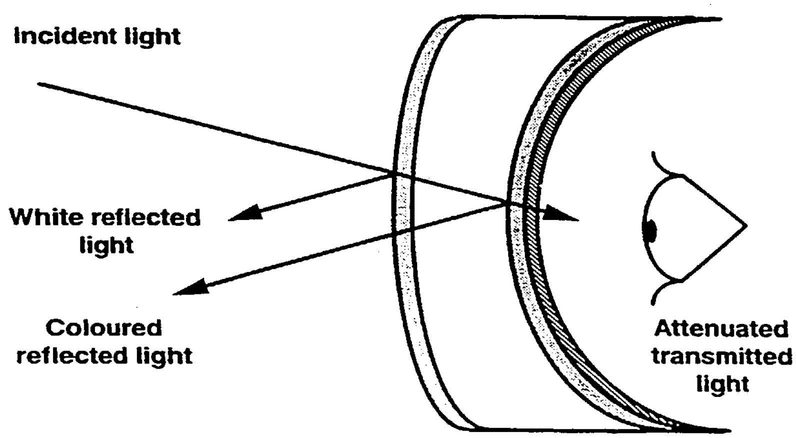
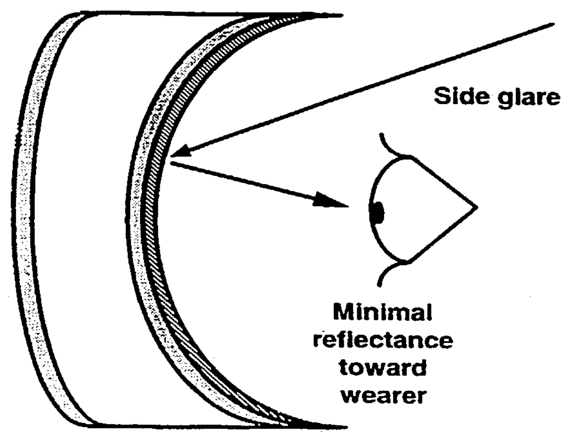

Incident light
White reflected light
Coloured reflected light
Attenuated transmitted light

FIGURE 11



COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (Includes Reference to Provisional and PCT International Applications)	Attorney's Docket No. 025265-155

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name;
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

COATED SUNGLASS LENS

the specification of which (check only one item below):

☐ is attached hereto.

☐ was filed as United States application
Number ____
on ____
and was amended
on ____ (if applicable).

☒ was filed as PCT international application
Number PCT/AU98/00868 ✓
on October 18. 1998 10-19-98
and was amended
on ____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(e) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

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COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. §119
Australia	PO9950	21/10/1997 ✓	X Yes __ No
Australia	PP8997	04/03/1999	X Yes __ No
			__ Yes __ No
			__ Yes __ No
			__ Yes __ No

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____ (Application Number) ____ (Filing Date)

 (10/99)

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONTINUED) (Includes Reference to Provisional and PCT International Applications)	Attorney's Docket No. 025265-155

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U.S. APPLICATIONS		STATUS (check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. APPLICATION NUMBERS ASSIGNED (if any)			

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONTINUED) (Includes Reference to Provisional and PCT International Applications)		Attorney's Docket No. 025265-155
FULL NAME OF SOLE OR FIRST INVENTOR: 1-00 Brandon YIP	SIGNATURE: Brandon Yip	DATE: 17/10/02
RESIDENCE: Unit 3, 4 Stirling Road, Blackwood, South Australia 5051, AUSTRALIA AUX		CITIZENSHIP: Australian
POST OFFICE ADDRESS: Unit 3, 4 Stirling Road, Blackwood, South Australia 5051, AUSTRALIA		
FULL NAME OF SECOND JOINT INVENTOR, IF ANY: 2-00 Colin James HALL	SIGNATURE: [illegible]	DATE: 4/11/02
RESIDENCE: Unit 2, 8 Hillview Crescent, South Brighton, South Australia 5048 AUSTRALIA AUX		CITIZENSHIP: Australian
POST OFFICE ADDRESS: Unit 2, 8 Hillview Crescent, South Brighton, South Australia 5048 AUSTRALIA		
FULL NAME OF THIRD JOINT INVENTOR, IF ANY: 3-00 Frank Arnold SAMSON	SIGNATURE: Frank Samson	DATE: 17/10/02
RESIDENCE: 2632 Cosgrove Road, Strathalbyn, South Australia 5255, AUSTRALIA AUX		CITIZENSHIP: Australian
POST OFFICE ADDRESS: 2632 Cosgrove Road, Strathalbyn, South Australia 5255, AUSTRALIA		
FULL NAME OF FOURTH JOINT INVENTOR, IF ANY: 4-00 Brian Douglas ADAMS	SIGNATURE: B. Adams	DATE: 17/10/02
RESIDENCE: 39 Darwendale Street, Huntfield Heights, South Australia 5163, AUSTRALIA AUX		CITIZENSHIP: Australian
POST OFFICE ADDRESS: 39 Darwendale Street, Huntfield Heights, South Australia 5163, AUSTRALIA		
FULL NAME OF FIFTH JOINT INVENTOR, IF ANY: 5-00 Randy Lee GOVE	SIGNATURE: Randy Gove	DATE: 21/10/02
RESIDENCE: 1202 Maple Drive, Rohnert Park, CA 94928, U.S.A. CA		CITIZENSHIP: United States
POST OFFICE ADDRESS: 1202 Maple Drive, Rohnert Park, CA 94928, U.S.A.		
FULL NAME OF SIXTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF SEVENTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF EIGHTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF NINTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE		CITIZENSHIP
POST OFFICE ADDRESS		